## Examples of State Level Allocation

The attached tables work through an example of allowance allocation at the state level. The first table postulates a set of EGU and non-EGU emitting units including conventional power plants, gas turbine peakers, industrial boilers and cogeneration units in both the EGU and non-EGU categories. The table includes three categories of conventional power plants to illustrate the allocation effects for plants that are more or less efficient. The table includes assumptions for plant efficiency, utilization and, for cogeneration facilities, power-to-heat ratio. It also assumes certain levels of total allowances for the EGU and non-EGU categories.

The second page shows how these assumptions work into various allocation options. The upper left hand section shows the raw allocation values as the plant performance data are applied to different allocation approaches including:

- Heat input - the heat input from EGUs is multiplied by 0.15 lb/MMBtu. Heat input from non-EGUs is multiplied by 0.17 lb/MMBtu.
- Electric output - all electric generation is multiplied by 1.5 lb/MWh
- Thermal output - all thermal output is multiplied by 0.22 lb/$MMBtu_{out}$
- NSPS approach - thermal output is discounted by 50 percent, converted to "electric equivalent" at a factor of 3413 Btu/kWh and the combined electric and thermal output is multiplied by 1.5 lb/MWh

In the right hand top block, these raw allocation values are subjected to the "ratchet" which normalizes the allocations to the total number of allowances available.

- Option 1 - The heat input allocations are ratcheted to available allowances separately for EGUs and non-EGUs.
- Option 2 - By category - All thermal and electric allowances for EGUs are ratcheted to the EGU total. All thermal and electric allowances for non-EGUs are ratcheted to the non-EGU total.
- Option 3 - By energy type - All allowances for thermal output are ratcheted to the non-EGU total and all allowances for electric generation are ratcheted to the EGU total regardless of which category they are actually in. This causes some "transfer" between the EGU and non-EGU categories.
- Option 4 - Total - The total thermal and electric output-based allocations are ratcheted to the total EGU and non-EGU allowances available. This causes some "transfer" between categories.
- Option 5 - the NSPS/50 percent allocations are ratcheted within the respective EGU and non-EGU categories.

The bottom half of the page shows the tonnage and percentage differences between cases. The last page shows summarizes the results in graphic form. In general, more efficient systems do better in the output cases than the input-based cases. The cogeneration systems do better when

they get full credit for both thermal and electric energy. In general, electricity generation gets somewhat higher allocation value than thermal energy.

While these trends are obvious, what changes in the various ratchet options is the way these changes are forced into the available allowances. The case shown here is only one of many possible outcomes. The final result depends on the mix of sources, their efficiency relative to each other, and the extent to which the EGU and non-EGU pools match or do not match the actual allocations. Some of these depend only on the variability of the state inventory and/or the development of the EPA budget numbers.

Allocation Options

| Unit Type | Heat Input Capacity (MMBtu/hr) | Electric Capacity (MW) | Steam Capacity (MMBtu/hr) | Heat Rate (Btu/kWh) | Power to Heat Ratio | Capacity Factor (%) | Heat input (MMBtu/5 mo) | Generation (MWh/5 mo) | Steam (MMBtu/5 mo) | Category Allocation (tons) |
|---|---|---|---|---|---|---|---|---|---|---|
| **EGU** | | | | | | | | | | |
| Lower Eff Blr | | 8,000 | | 12,000 | | 55% | 193,881,600 | 16,156,800 | - | 48,950 |
| Average Boiler | | 12,000 | | 10,000 | | 65% | 286,416,000 | 28,641,600 | - | |
| Higher Eff Blr | | 5,000 | | 9,000 | | 65% | 107,406,000 | 11,934,000 | - | |
| GT | | 174 | | 13,000 | | 5% | 415,303 | 31,946 | - | |
| CC Cogen | | 800 | 2,047 | 8,533 | 1.33 | 75% | 18,793,296 | 2,203,200 | 5,637,989 | |
| Boiler Cogen | | 300 | 320 | 10,666 | 3.20 | 75% | 8,809,358 | 826,200 | 880,936 | |
| **Non-Egu** | | | | | | | | | | |
| Boiler | 34,587 | | 27,670 | | | 46% | 58,421,593 | - | 46,737,275 | 7,532 |
| Boiler Cogen | | 300 | 5,275 | 26,254 | 0.19 | 75% | 21,690,928 | 826,200 | 14,528,663 | |
| Turbine Cogen | | 100 | 632 | 12,641 | 0.54 | 75% | 3,480,240 | 275,400 | 1,740,120 | |
| | 34,587 | 26,674 | 35,944 | | 0.22 | 62% | 699,314,318 | 60,895,346 | 69,524,983 | 56,482 |

# Allocation Analysis for: Att C-2.xls

| | Allocation Components | | | | Ratchet | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Heat Input | Electric Output | Thermal Output | NSPS Elec+50% | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
| Unit Type | 0.15 EGU 0.17 Non | 1.5 lb/MWh | 0.22lb/MMBtu | Thermal 1.5 lb/MWh | Heat Input | Output By Category | Output By Energy Type | Output Total | Output NSPS |
| **EGU** | | | | | | | | | |
| Lower Eff Blr | 14,541 | 12,118 | - | 12,118 | 15,414 | 13,019 | 12,987 | 12,836 | 13,131 |
| Average Boiler | 21,481 | 21,481 | - | 21,481 | 22,770 | 23,078 | 23,023 | 22,755 | 23,278 |
| Higher Eff Blr | 8,055 | 8,951 | - | 8,951 | 8,539 | 9,616 | 9,593 | 9,481 | 9,699 |
| GT | 31 | 24 | - | 24 | 33 | 26 | 26 | 25 | 26 |
| CC Cogen | 1,409 | 1,652 | 620 | 1,934 | 1,494 | 2,442 | 2,382 | 2,407 | 2,096 |
| Boiler Cogen | 661 | 620 | 97 | 664 | 700 | 770 | 760 | 759 | 719 |
| | 46,179 | 44,845 | 717 | 45,171 | 48,950 | 48,950 | 48,771 | 48,265 | 48,950 |
| **Non-EGU** | | | | | | | | | |
| Boiler | 4,966 | - | 5,141 | 4,674 | 5,264 | 4,992 | 5,063 | 5,446 | 5,243 |
| Boiler Cogen | 1,844 | 620 | 1,598 | 1,763 | 1,954 | 2,153 | 2,238 | 2,349 | 1,977 |
| Turbine Cogen | 296 | 207 | 191 | 277 | 314 | 386 | 410 | 422 | 311 |
| | 7,105 | 826 | 6,931 | 6,714 | 7,532 | 7,532 | 7,711 | 8,217 | 7,532 |
| | 53,285 | 45,672 | 7,648 | 51,885 | 56,482 | 56,482 | 56,482 | 56,482 | 56,482 |

**Summary of Allocation Changes**

| | Option 1 to Option 2 | Option 1 to Option 3 | Option 1 to Option 4 | Option 1 to Option 5 | Option 2 to Option 3 | Option 1 to Option 2 | Option 1 to Option 3 | Option 1 to Option 4 | Option 1 to Option 5 | Option 2 to Option 3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **EGU** | | | | | | | | | | |
| Lower Eff Blr | (2,395) | (2,426) | (2,577) | (2,282) | (31) | -16% | -16% | -17% | -15% | 0% |
| Average Boiler | 308 | 253 | (15) | 508 | (55) | 1% | 1% | 0% | 2% | 0% |
| Higher Eff Blr | 1,077 | 1,054 | 943 | 1,160 | (23) | 13% | 12% | 11% | 14% | 0% |
| GT | (7) | (7) | (8) | (7) | (0) | -22% | -22% | -23% | -21% | 0% |
| CC Cogen | 947 | 888 | 913 | 602 | (60) | 63% | 59% | 61% | 40% | -4% |
| Boiler Cogen | 69 | 59 | 59 | 19 | (10) | 10% | 8% | 8% | 3% | -1% |
| | 0 | (179) | (685) | 0 | (179) | 0% | -0.4% | -1% | 0% | -0.4% |
| **Non-EGU** | | | | | | | | | | |
| Boiler | (272) | (201) | 182 | (21) | 71 | -5% | -4% | 3% | 0% | 1% |
| Boiler Cogen | 199 | 284 | 395 | 23 | 85 | 10% | 15% | 20% | 1% | 4% |
| Turbine Cogen | 73 | 96 | 108 | (2) | 23 | 23% | 31% | 34% | -1% | 7% |
| | (0) | 179 | 685 | (0) | 179 | 0% | 2% | 9% | 0% | 2% |

# Allowance Allocation Comparison